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ABSTRACT

The structural model of positive and negative cognition derives from principles of information processing, intrapersonal communication, and cybernetic self-regulation. The model proposes five distinct states of mind quantitatively defined by the proportion of positive to total cognition. A positive dialogue with a set point proportion of .618 plus or minus .06 is considered a functionally optimal balance because of information processing properties that render negative events maximally striking. States of mind that deviate from this optimal balance are associated with psychopathology. Specifically, mild dysfunction is characterized by an internal dialogue of conflict with a set point of .500 plus or minus .05 and moderate dysfunction by a negative dialogue with a set point of .382 plus or minus .06. Analyses of 27 studies of normal, anxious, and depressed subjects indicated that the model fit existing data. Insufficient data were available to evaluate the two extreme states of mind--positive monologue (greater than or equal to .69) and negative monologue (lesser than or equal to .31). The states of mind model provides a theoretical and empirical framework for the study of cognitive balance in development, psychopathology, and psychotherapy. (Data tables and graphs are included.) (Author)

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States of Mind Model: Anxiety, Depression, and Coping With Stress

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[1]Presented at 94th Annual Convention of the American Psychological Association at Washington, D.C., August 1986.

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Abstract

This paper presents a structural model of positive and negative cognition derived from principles of information processing, intrapersonal communication, and cybernetic self-regulation. The model proposes five distinct states of mind quantitatively defined by the proportion of positive to total cognition. A positive dialogue with a set point proportion of .618 ± .06 is considered a functionally optimal balance because of information processing properties that render negative events maximally striking. States of mind that deviate from this optimal balance are associated with psychopathology. Specifically, mild dysfunction is characterized by an internal dialogue of conflict with a set point of .500 ± .05 and moderate dysfunction by a negative dialogue with a set point of .382 ± .06. Analyses of 27 studies of normal, anxious, and depressed subjects indicate that the model fits existing data. Insufficient data were available to evaluate the two extreme states of mind--positive monologue ($\geq$ .69) and negative monologue ($\leq$ .31). The states of mind model provides a theoretical and empirical framework for the study of cognitive balance in development, , psychopathology and psychotherapy.

States of Mind Model: Anxiety, Depression, and Coping With Stress

The structural model of positive and negative states of mind draws upon principles of information processing (Garner, 1962), cybernetic self-regulation (Carver & Scheier, 1981) and intrapersonal communication (Meichenbaum, 1977), as well as on the less familiar "golden section hypothesis" (Adams-Webber, 1982; Berlyne, 1971). The purpose of the present paper is to elaborate upon the information processing principles that underlie the model and to review the empirical support for the model derived from 27 studies of anxiety, depression, and coping with stress.

The golden section hypothesis, which is central to the model, holds that "while we construe most events positively, we attempt to create a harmony between positive and negative events such that the latter make a maximal contribution to the whole" (Benjafield & Adams-Webber, 1976, p. 14). This hypothesis suggests that an optimal balance of positive and negative cognition characterizes effective psychological functioning.

As depicted in Figure 1, the golden section can be defined by that point (C) on a line (AB) that divides it into two segments such that the ratio of the smaller segment (CB) to the larger segment (AC) is equal to the ratio of of the larger segment (AC) to the whole line (AB). The equality of these ratios is achieved only when the larger segment is .618 and the smaller segment .382 of the line (.382/.618 = .618/1.00). The golden section has many unique mathematical properties, has been observed in nature, and has been incorporated into the design of artistic and architectural works. Extending the golden section hypothesis to interpersonal judgments, social psychologists demonstrated experimentally that when people differentiate things into two, they do so in a way that approximates the golden section (See Adams-Webber, 1982 for review).

Berlyne (1971), based on the work of Frank, argued that the importance of

the golden section may be explained by the concept of strikingness--the contribution of a class of elements to average uncertainty or information content. The psychological impact of a particular category of information elements depends on both its information content and its relative frequency of occurrence. Thus, an index of strikingness can be obtained by combining these two concepts into the formula, $p_i \log_2 1/p_i$, where p_i represents the relative frequency or probability of occurrence of a particular category of information elements or signals (i), and $\log_2 1/p_i$ stands for the information content of that particular category. By summing the product of these two terms ($p_i \log_2 1/p_i$) over all categories of information elements, one obtains the measure of average uncertainty or average information ($\Sigma p_i \log_2 1/p_i$) that is fundamental to information theory (cf. Garner, 1962). The maximum contribution of an information element to average uncertainty ($p_i \log_2 1/p_i = .531$) occurs when its relative frequency of occurrence is about 37 percent ($p_i = .368$). Thus, the psychological strikingness or salience of a category of information is optimal when the frequency of that category relative to other categories (37 versus 63 percent) approximates the frequency of the minor relative to the major element in the golden section (38 versus 62 percent). In terms of adaptation, an optimal information processing strategy would be one that organized cognition according the golden section, thereby allowing negative, threatening events to be maximally striking (Adams-Webber, 1982). While social psychologists have demonstrated that presumably normal individuals balance their interpersonal judgments according to the golden section, we were interested in modeling positive-negative balance in the internal dialogue with functional and dysfunctional groups defined according to clinical criteria (Schwartz & Garamoni, 1986).

States of Mind Defined

The states of mind model proposes five distinct *states of mind* (SOM) conceptualized within an intrapersonal communication framework and utilizing as a variable the balance of positive to total cognition or P/(P + N) (See Figure 2). Three SOMs--*positive dialogue*, *internal dialogue of conflict*, and *negative dialogue*--are dialogic in form because they capture the dialectical interaction between positive and negative thoughts. Two SOMs--*positive monologue* and *negative monologue*--are monologic in form because in these extreme SOMs positive or negative cognitions predominate to such an extent that the dialectical process is relatively abandoned.

The dialogic SOMs are defined in terms of both specific *cognitive-affective set points* and by *ranges* that surround the set point; the monologic SOMs do not have set points and are thus defined in terms of ranges alone. The set point notion is based on the idea that cybernetically controlled systems strive to maintain a fixed reference value (cf. Carver & Scheier, 1981). When discrepancies are detected, self-regulatory processess are initiated to restore the lost balance--a process analogous to the maintenance of homeostasis in body systems such as temperature (cf. Cannon, 1932) (See Figure 3).

The SOM model proposes that humans monitor their thoughts and feelings--presumably at the level of both automatic and controlled processing (Schneider & Shiffrin, 1977)--in order to maintain the balance of positive and negative elements defined by their set point. According to the SOM model, functional individuals strive to maintain a set point of .618, the golden section proportion; lasting deviations in either direction from this optimal balance are hypothesized to represent increasing degrees of dysfunction.

The respective set points and ranges for each SOM are quantitatively defined by the proportion of positive to total cognition, or P/(P + N), which is the same measure that has been employed in the golden section literature and

represents the probability or frequency term (p_i) for positive information in the formula for average uncertainty ($\Sigma p_i \log_2 p_i$) in information theory. Drawing upon these concepts, we modeled a dichotomous distribution of positive (P) and negative (N) cognitions to describe the relation between the SOM proportion (P/(P + N)), average uncertainty ($\Sigma p \log_2 1/p_i$), positive strikingness [p(P) $\log_2$ 1/p(P)], and negative strikingness [p(N) $\log_2$ 1/p(N)] (Baraaoni & Schwartz, 1986). These relationships are depicted in Figure 4, which plots values of average uncertainty, positive strikingness, and negative strikingness as a function of values of SOM proportion. Negative strikingness, which was discussed earlier, is an index of the salience of negative information. Similarly, positive strikingness is introduced here to represent the psychological impact or salience of positive information. Average uncertainty in this dichotomous distribution equals the sum of strikingness indices for positive and negative cognitions.

As can be seen in Figure 4, five values of the SOM proportion variable (0.0, .37, .50, .63, 1.0)--which correspond closely to the five SOMs--are associated with one or more unique properties that emerge on curves plotted for average uncertainty and strikingness indices. When the SOM proportion equals .63 (near .62, the positive dialogue set point), negative strikingness is maximal. When the SOM proportion equals .37 (near .38, the negative dialogue set point), positive strikingness is maximal. When the SOM proportion equals .50 (the internal dialogue of conflict set point), average uncertainty is maximal, and only at this point are the indices of positive and negative strikingness equal. As the SOM proportion approaches zero (negative monologue), average uncertainty is reduced rapidly toward zero, with larger reductions in positive relative to negative strikingness. Finally, as the SOM proportion approahces 1.0 (positive monologue), average uncertainty is also reduced rapidly

toward zero, but with larger reductions in negative relative to positive strikingness.

Based on these information processing formulations, the clinical significance of each state mind can be elaborated. The positive dialogue is hypothesized to be the optimal SOM for coping with stress and psychological adaptation because it allows the individual to maintain a generally positive state of cognition and affect, while remaining maximally attentive to threat. Clinically, the positive dialogue characterizes the well adjusted person whose internal dialogue, while positively balanced, contains enough "negative" thought to remain realistically cautious. The negative dialogue represents a rotation of the "preferred" form of the positive dialogue (1 - .618 = .382). Based on the Gestalt concept of pattern goodness, when a given form is preferred, there is also a preference for the systematic rotations of this form (cf. Garner, 1974). Structurally, the negative dialogue is similar to the positive dialogue, but contains predominantly negative cognitions and affects. Clinically, the negative dialogue characterizes moderately anxious or depressed persons.

The symmetrically balanced internal dialogue of conflict is empirically grounded in Schwartz and Gottman's (1976) finding that nonassertives were characterized by equal amounts of positive and negative self-statements (cf. Schwartz, in press). Since each positive thought or feeling is balanced by a corresponding negation, the internal dialogue of conflict results in conflict and stasis. Clinically, this SOM is associated with mild dysfunctional states.

The positive monologue exceeds the optimal balance of positive thoughts and feelings specified by the golden section proportion. Although the increased positivity may be immediately reinforcing, in the long run threatening events may go unnoticed leaving the individual vulnerable to danger. Clinically, the positive monologue is exemplified by certain forms of hypomania and mania. The negative monologue is characterized by undiluted negativity, typically

associated with severe psychopathology such as profound depression or acute panic. Because they lack set points, both the positive and negative monologues are considered less stable than the dialogic SOMs; because they are extreme, they should be less frequently encountered.

Schwartz and Garamoni (1984, 1986) identified 27 empirical studies that reported positive and negative cognition data suitable to evaluate the SOM model. These studies included multiple types of disorder (i.e., anxiety, depression, and coping with stress), types of cognitive constructs (i.e., internal dialogue and memory/free association), types of study (i.e., group contrast and psychotherapy outcome), and types of cognitive assessment techniques (i.e., recognition and production) (See Table 1).

Consistent with the model, functional samples were characterized by a positive dialogue, mildly dysfunctional samples by an internal dialogue of conflict and moderately dysfunctional samples by a negative dialogue (See Figure 5). Specifically, the obtained mean SOM proportion for functional samples was .630, which did not differ signficantly from the positive dialogue set point of .618 (95% Conf. Int. = .609 - .651); the overall mean SOM for dysfunctionals of .455 did differ significantly (95% Conf. Int. = .427 - .484). For mild dysfunctionals, the obtained mean proportion of .489 did not differ from the IDC set point of .500 (95% Conf. Int. = .470 - .507). For moderate dysfunctionals, the obtained SOM proportion of .374 did not differ from .382, the negative dialogue set point (95% Conf. Int. = .307 - .440). The obtained ranges, defined by the mean of each SOM category plus and minus one standard deviation, also corresponded closely to the theoretical ranges (See Table 2).

Additional analyses revealed that these results obtained across modes of cognition (i.e., internal dialogue versus self-referent memory--see Table 3);

nature of clinical disorder (i.e., depression and anxiety--see Table 4); type of study (i.e., group contrast versus psychotherapy outcome--see Table 5); and types of cognitive assessment (i.e., inventory versus production--see Table 6).

These findings support the following conclusions:

1. **An optimal balance of positive and negative cognition is associated with effective psychological functioning.** Specifically, functional individuals are characterized by a positive dialogue (.618), mild dysfunctionals by an internal dialogue of conflict (.500), and moderate dysfunctionals by a negative dialogue (.382).

2. Analagous to homeostatic body systems, positive and negative states of mind appear to be governed by a cognitive-affective set point that cybernetically regulates equilibrium with considerable precision.

3. Bidimensional assessment strategies that integrate positive and negative cognitions are conceptually and empirically warranted.

4. The SOM model provides a guiding theoretical framework for future study of the role of cognitive balance in development, psychopathology, and the process of change in psychotherapy.

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Table 1

Characteristics of Cases

Characteristic	No. studies	No. cases	Functional cases	Dysfunctional cases		
				Total	Mild	Mod
Type of cognitive construct						
Internal dialogue	19	43	22	21	18	3
Memory/free association	8	20	10	10	4	6
Type of study						
All studies	27	63	32	31	22	9
Group contrast	22	48	24	24	17	7
Psychotherapy	5	15	8	7	5	2
Type of disorder						
Anxiety	16	37	19	18	16	2
Depression	9	20	10	10	4	6
Miscellaneous	3	6	3	3	2	1
Type of cognitive assessment						
Recognition	15	35	18	17	15	2
Production	12	28	14	14	7	7
Self-statement inventory	11	27	14	13	13	0
Other	16	36	18	18	9	9

Table 2

Comparisons of Theoretical and Obtained State of Mind (SOM) Values for Functional and Dysfunctional Cases

State of Mind	Theoretical values: SOM range	Comparison group	No. cases	Obtained values: *M* ± *SD*	95 percent confidence interval
Positive Dialogue	.618 ± .06	Functional	32	.630 ± .059	.609 — .651
		Dysfunctional	31	.455 ± .078	.427 — .484
Internal Dialogue of Conflict	.500 ± .05	Mildly dysfunctional	22	.489 ± .043	.470 — .507
Negative Dialogue	.382 ± .06	Moderately dysfunctional	9	.374 ± .087	.307 — .440

Table 3

Comparisons of Theoretical and Obtained State of Mind (SOM) Values for Cases Assessed for Different Types of Cognitive Constructs

Group/ Cognitive construct	No. Cases	Obtained SOM *M* ± *SD*	95 percent confidence interval
Comparisons with Positive Dialogue (.618 ± .06)			
Functional			
Internal dialogue	22	.624 ± .059	.598 — .650
Self-referent memory/ free association	10	.643 ± .059	.601 — .685
Dysfunctional			
Internal dialogue	21	.460 ± .080	.423 — .496
Self-referent memory free association	10	.446 ± .076	.392 — .501
Comparisons with Internal Dialogue of Conflict (.500 ± .05)			
Mildly dysfunctional			
Internal dialogue	18	.487 ± .038	.468 — .506
Self-referent memory/ free association	4	.495 ± .065	.390 — .599
Comparisons with Negative Dialogue (.382 ± .06)			
Moderately dysfunctional			
Internal dialogue	3	.293 ± .061	.143 — .444
Self-referent memory/ free association	6	.414 ± .069	.342 — .486

Table 4

Comparisons of Theoretical and Obtained State of Mind (SOM) Values for Different Types of Disorders

Type of disorder	No. Cases	Obtained SOM *M* ± *SD*	95 percent confidence interval
Comparisons with Positive Dialogue (.618 ± .06)			
Functional			
Nonanxious	19	.624 ± .063	.593 — .654
Nondepressed	10	.646 ± .059	.604 — .688
Dysfunctional			
Anxious	18	.462 ± .080	.422 — .502
Depressed	10	.445 ± .078	.388 — .501
Comparisons with Internal Dialogue of Conflict (.500 ± .05)			
Mildly anxious	16	.486 ± .039	.465 — .506
Mildly depressed	4	.495 ± .065	.390 — .599
Comparisons with Negative Dialogue (.382 ± .06)			
Moderately anxious[a]	2	.270 ± .064	—
Moderately depressed	6	.411 ± .072	.336 — .486

[a] Too few cases to compute confidence intervals.

Table 5

Comparisons of Theoretical and Obtained State of Mind (SOM) Values for Cases from Different Types of Studies

Type of disorder	No. Cases	Obtained SOM *M* ± *SD*	95 percent confidence interval
Comparisons with Positive Dialogue (.618 ± .06)			
Functional			
Group contrast	24	.646 ± .056	.622 — .670
Psychotherapy	8	.582 ± .040	.548 — .616
Dysfunctional			
Group contrast	24	.466 ± .067	.437 — .494
Psychotherapy	7	.419 ± .106	.321 — .517
Comparisons with Internal Dialogue of Conflict (.500 ± .05)			
Mildly dysfunctional			
Group contrast	17	.492 ± .048	.467 — .516
Psychotherapy	5	.478 ± .015	.459 — .498
Comparisons with Negative Dialogue (.382 ± .06)			
Moderately dysfunctional			
Group contrast	7	.403 ± .069	.340 — .467
Psychotherapy[a]	2	.270 ± .064	—

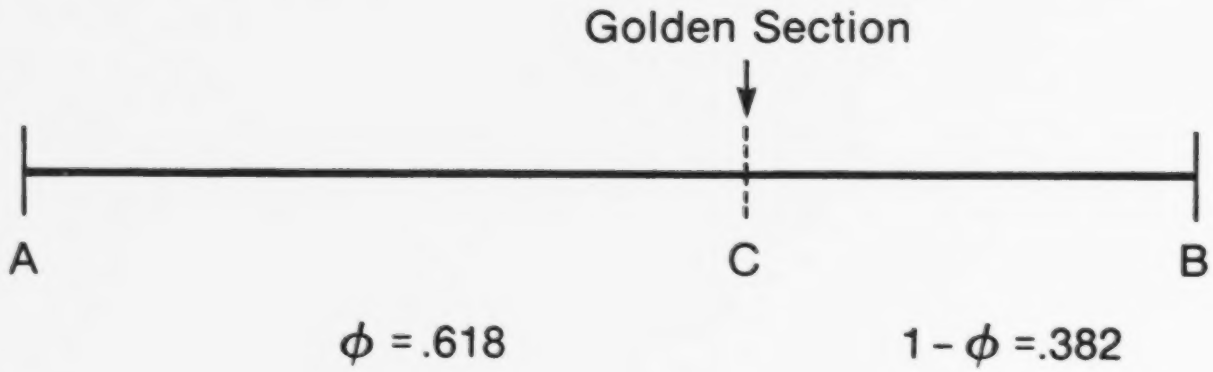
[a] Too few cases to compute confidence intervals.

Table 6

Comparisons of Theoretical and Obtained State of Mind (SOM) Values for Cases Classified According to Type of Cognitive Assessment Method Employed

Group/ Cognitive assessment method	No. Cases	Obtained SOM *M* ± *SD*	95 percent confidence interval
Comparisons with Positive Dialogue (.618 ± .06)			
Functional			
Recognition	18	.627 ± .062	.596 — .658
Production	14	.634 ± .056	.602 — .667
Self-statement inventory	14	.607 ± .046	.580 — .634
Other	18	.648 ± .063	.616 — .679
Dysfunctional			
Recognition	17	.481 ± .049	.456 — .506
Production	14	.424 ± .096	.369 — .479
Self-statement inventory	13	.498 ± .030	.480 — .516
Other	18	.424 ± .088	.381 — .468
Comparisons with Internal Dialogue of Conflict (.500 ± .05)			
Mildly dysfunctional			
Recognition	15	.492 ± .033	.474 — .510
Production	7	.481 ± .061	.424 — .537
Self-statement inventory	13	.498 ± .030	.480 — .516
Other	9	.475 ± .055	.433 — .517
Comparisons with Negative Dialogue (.382 ± .06)			
Moderately dysfunctional			
Recognition	2[a]	.395 ± .078	—
Production	7	.368 ± .094	.281 — .454
Self-statement inventory	0[a]	—	—
Other	9[a]	.374 ± .087	.307 — .440

[a] Too few cases to compute confidence intervals.



Golden Section Proportion:

$$\frac{\text{Smaller Segment (CB)}}{\text{Larger Segment (AC)}} = \frac{\text{Larger Segment (AC)}}{\text{Whole Line (AB)}}$$

FIGURE I. The golden section of a line segment. (AC must be .618 of the line AB for the above ratios to be equal. The golden section proportion is designated by the Greek letter "phi," ϕ.)

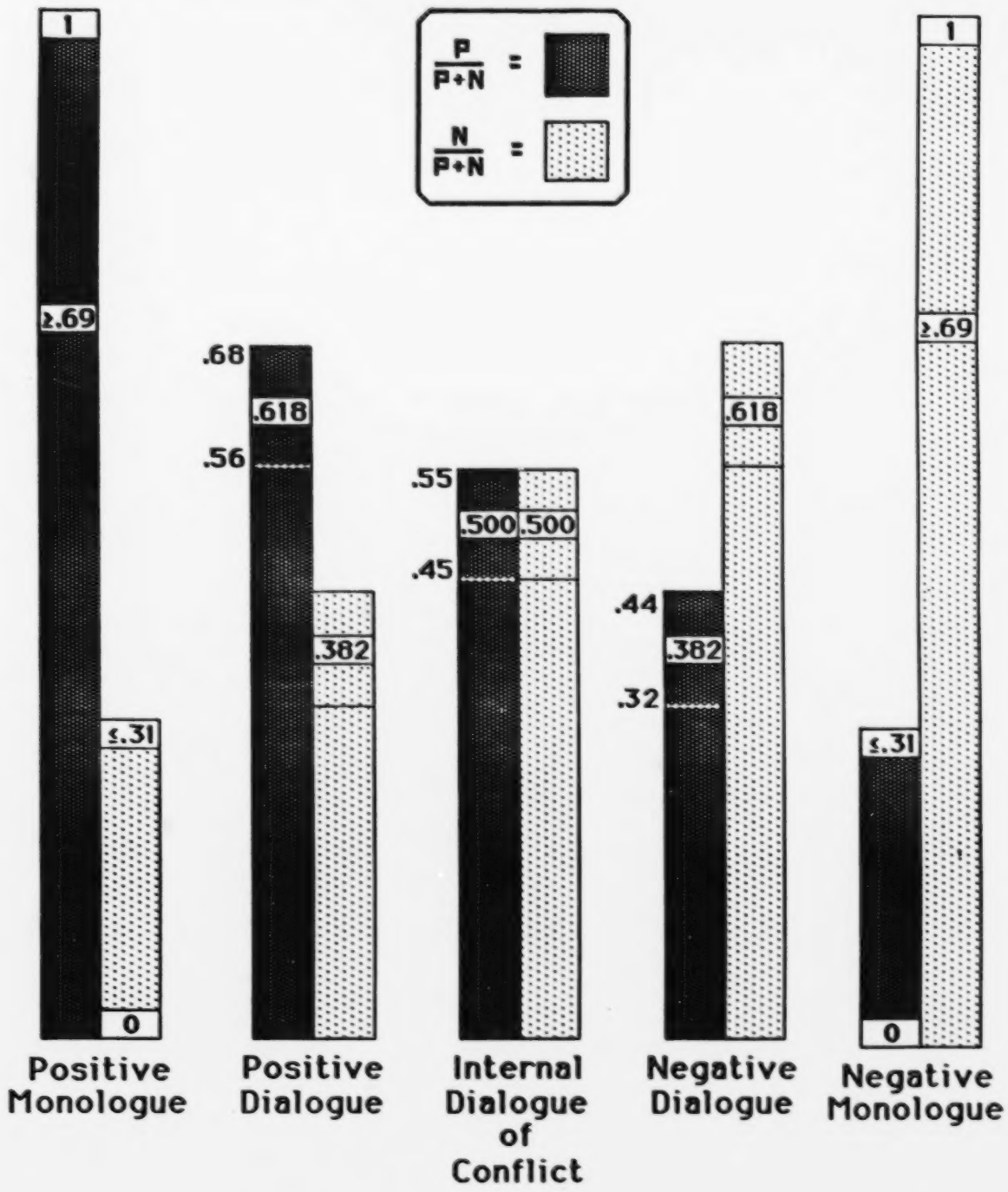


Figure 2. Structural model of positive and negative states of mind.

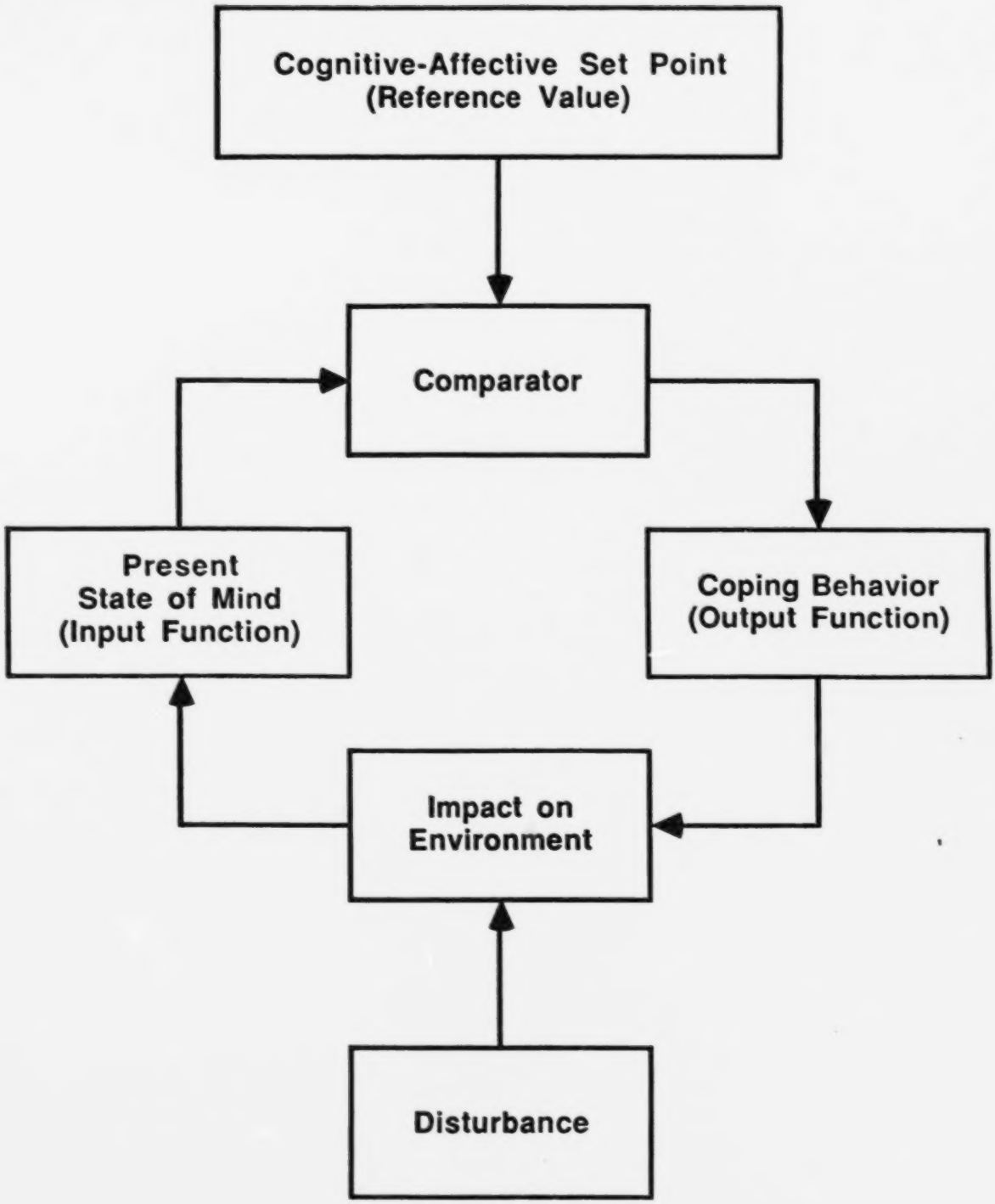


Figure 3. State of mind in a cybernetic, negative feedback loop.

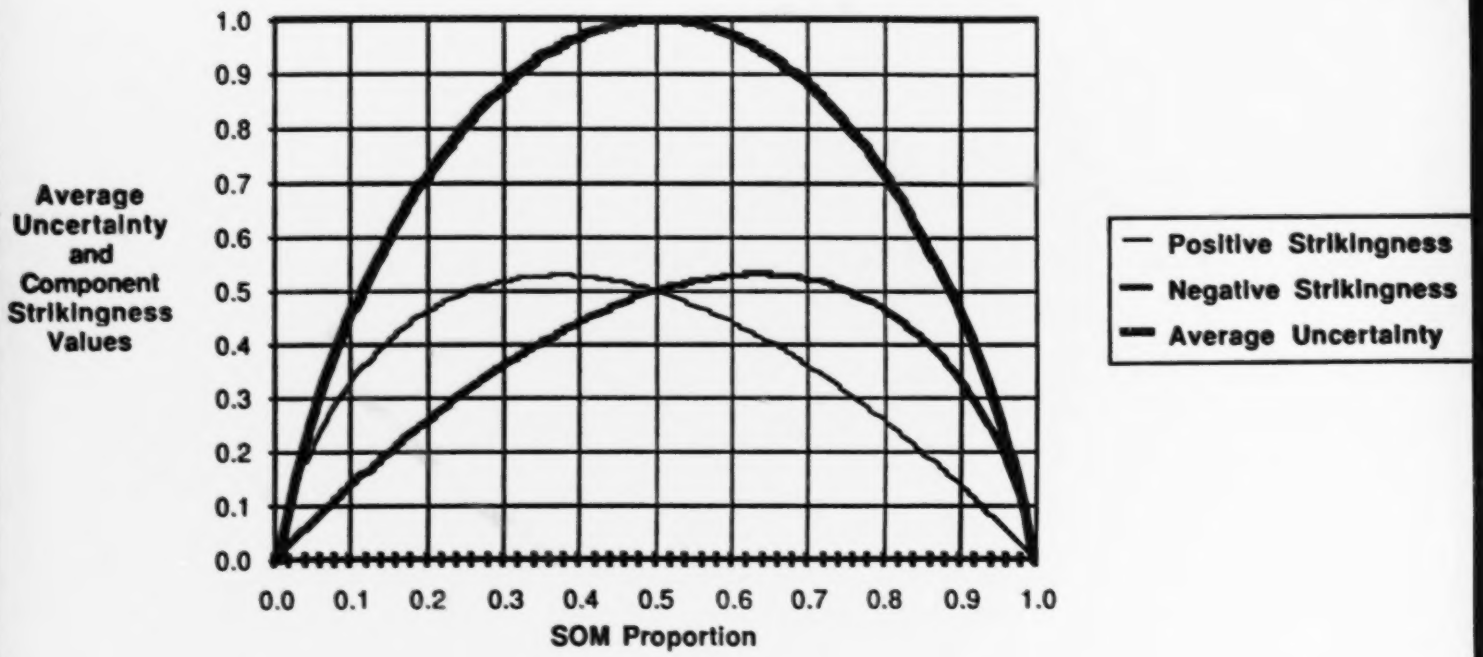


Figure 4. Positive strikingness, negative strikingness, and average uncertainty as a function of state of mind (SOM) proportion.

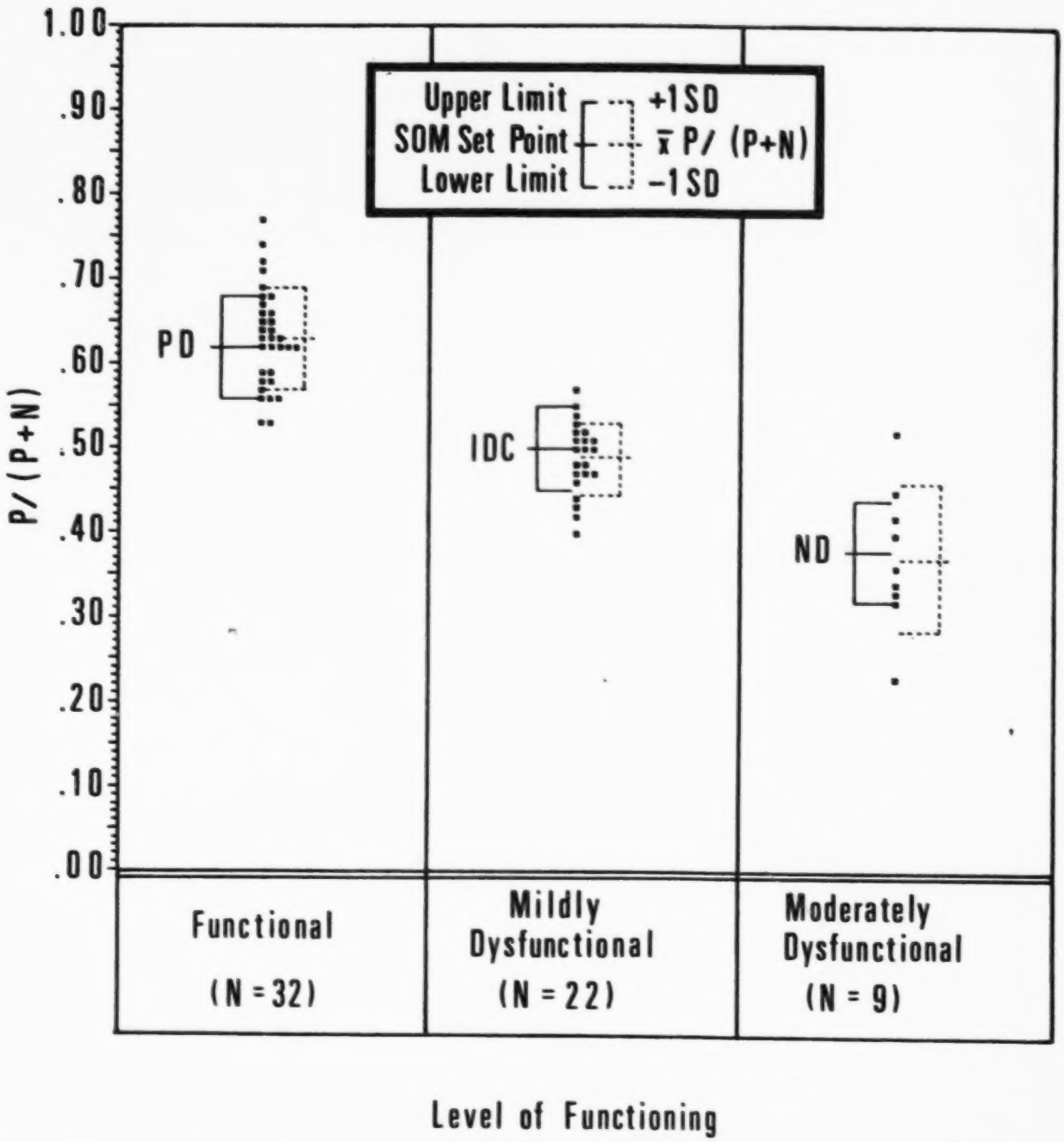


FIGURE 5. Distribution of mean state of mind (SOM) proportions for functional and dysfunctional groups. (The legend indicates the set points and ranges for the theoretical (solid lines) and obtained (dotted lines) SOMs. P/(P + N) = the proportion of positive to total cognitions.)